

QUICK RELEASE SACRIFICIAL SHIELD FOR WINDOW ASSEMBLYRelated Applications

401 5 The present application is a continuation of U.S. Patent Application Serial No. 09/395,692 filed September 13, 1999, ^{now U.S. Patent No. 6,408,574,} entitled Quick Release Sacrificial Shield For Window Assembly which was a continuation-in-part of U.S. Patent Application Serial No. 09/186,513, filed November 4, 1998, entitled Quick Release Sacrificial Shield For Window Assembly now U.S. Patent No. 6,205,723, issued March 27, 2001.

Field of the Invention

10 The present invention relates to window assemblies and apparatus for protecting the glazing of motor vehicles. More particularly, the present invention relates to a window assembly for use in mass transit vehicles which allows the quick and easy removal and replacement of transparent sacrificial protective panels which protect the glazing of a window from vandalism and wear.

Background of the Invention

15 A sacrificial protective panel is typically a relatively inexpensive transparent sheet of material, such as plastic, protecting a more expensive windowpane or glazing behind it. Generally of the same shape and size as the glazing they protect, sacrificial protective panels are typically positioned against the glazing, with the protective panel desirably absorbing any impact and/or damage directed towards the glazing. Desirably, any damage to the window assembly will be limited to the protective panel, which can be replaced at low cost, thereby significantly increasing the useful life of the window assembly. In addition, various types of solvents which cannot be used on the glass windowpane can often be used on the glazing panels to remove graffiti. Window assemblies employing sacrificial protective panels are commonly used in mass-transit vehicles, particularly buses and trains, where vandalism and wear to the glazing are problems. Use of sacrificial protective panels saves the cost and difficulty incurred with removing and replacing the complete window assembly.

20 25 30 Various types of sacrificial protective panels and mounting arrangements for windows of mass transit vehicles are well known in the art. For example, United States

Patents Nos. 5,242,207 and 5,735,089, which are incorporated herein by reference, describe and illustrate window protectors for use in mass transit vehicles. While these arrangements allow the use of sacrificing protective panels, the installation and replacement process of glazing panels in these arrangements is typically a time-intensive process which requires a number of specialized tools to complete. On the other hand, window assemblies incorporating easily-removable sacrificial panels typically also permit vandals to remove these same protective panels, significantly increasing the likelihood of damage to the glazing. In addition, where a protective panel is held in the window assembly by one or more exposed flexible mountings and/or gaskets, such mountings and/or gaskets can easily be damaged by vandals, necessitating expensive and time-consuming replacement of the mountings and/or gaskets as well as the remaining components of the window assembly.

Hence, there is continuing need for improved assemblies for protecting window glazing in mass transit vehicles from damage. While some of the existing assemblies do provide protection, some of the existing assemblies are often more difficult to manipulate such that replacement of the sacrificial protective sheets, or even the glazing itself, is complicated. Generally, it is preferable to be able to quickly replace all of the necessary protective sheets and glazing with a minimum of time and effort in order to keep maintenance costs at a minimum.

Further, existing window protection assemblies typically only protect the inner surface of the glazing. It will be appreciated, however, that both the inner surfaces and the outer surfaces of the glazing can be damaged thereby affecting the appearance of the window.

A need in the art exists, therefore, for a sacrificial protective panel and mounting arrangement in which the glazing panels can be quickly and conveniently replaced with a minimum of specialized tools, but in which the protective panel cannot easily be removed and/or the mounting assembly cannot easily be damaged by non-maintenance personnel. Moreover, this mounting assembly should also be suited for protecting both sides of the glazing of a window and still permit easy replacement and repair.

Summary of the Invention

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5 The aforementioned needs are satisfied by one aspect of the invention that relates to a window assembly for a mass transportation vehicle. The assembly comprises a piece of glazing having an inner and an outer side, and a first protective panel having a first and a second lateral edge. The assembly further comprises a frame defining an aperture and is adapted to receive the piece of glazing so that the piece of glazing is retained in the aperture. The frame includes a retainer wherein the frame and retainer define a first and a second recess having a lip and a recessed surface into which the first and second lateral edges of the first protective panel are positioned to thereby retain the first protective panel such that the first protective panel is positioned inward of the inner side of the piece of glazing. The first lateral edge rests on the recessed surface of the first recess when positioned inward of the inner side of the piece of glazing. The protective panel is movable into the second recess a distance selected such that the first lateral edge of the protective panel is exposed from the first recess to thereby permit removal of the first protective panel from the retainer.

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In one embodiment, the frame defines openings adapted to receive the retainers. The retainer defines a leg that is positioned in the opening. The leg of the retainer includes serrations and the opening has serrations such that the serrations engage with each other to facilitate retaining the retainer in the opening.

20 In one embodiment, the protective panel is positioned adjacent the piece of glazing, and in one configuration the protective panel is positioned in contact with the piece of glazing.

25 In one embodiment, the frame includes a support base that extends into the aperture defined by the frame, and the support base has a first face which supports the piece of glazing within the aperture of the frame.

30 In one embodiment, the retainer includes a window gasket that is positioned in the retainer so that when the retainer is positioned in the opening, the gasket contacts the inner side of the piece of glazing and thereby urges the piece of glazing against the first face of the support base. The bottom edge of the protective panel is positioned against the window gasket when the retainer is positioned in the opening to thereby retain the retainer in the opening. The retainer includes a protective panel gasket that is

positioned in the retainer so that when the retainer is positioned on the retaining surface, the protective panel gasket contacts a first side of the protective panel and thereby urges the protective panel towards the inner side of the piece of glazing.

5 In one embodiment, the window assembly further comprises a second protective panel positioned adjacent the outer side of the piece of glazing. The retainer retains the piece of glazing, the first protective panel and the second protective panel within the aperture defined by the frame. Removal of the first protective panel and the retainer permits removal of the piece of glazing and the second protective panel.

10 In one embodiment, the first and second recesses are located at the bottom and top of the frame respectively. As such, gravity urges the first lateral edge of the protective panel against the first recessed surface.

15 Another aspect of the invention relates to a method of using a protective panel positioned inward of an inner side of a piece of glazing mounted in a frame of a mass transit vehicle window to protect the piece of glazing. The method comprises positioning an upper edge of the protective panel into a void defined by an upper retainer located at the upper edge of the frame such that a lower edge of the protective panel is positioned adjacent a lip of a lower retainer. The method further comprises positioning the lower edge of the protective panel inward past the lip of the lower retainer, and moving the lower edge of the protective panel downward in an opening at least partially defined by the lower retainer until the lower edge rests on a recessed surface and so that the upper edge is retained in the void by the upper retainer.

20 In one embodiment, the method further comprises acts of moving the protective panel upwards, when the protective panel is positioned in inward of the window, such that the upper edge of the protective panel is urged into the void so that the lower edge of the protective panel exposed with respect to the lip of the lower retainer. The method further comprises extracting the exposed lower edge of the protective panel from the opening defined by the lower retainer to thereby remove the protective panel for replacement purposes.

25 In one embodiment, the method further comprises mounting the upper and lower retainers in the frame of the window. Mounting the upper and lower retainers in the frame of the window comprises mounting the retainers such that the protective panel is

positioned immediately adjacent the inner surface of the piece of glazing. In one configuration, mounting the upper and lower retainers in the frame of the window comprises positioning the retainers in openings defined in the frame.

From the foregoing it will be appreciated that the present invention allows for simplified installation and removal of protective panels positioned about the piece of glazing in a mass transit vehicle. These and other objects and advantages of the present invention will become more apparent from the following description taken in conjunction with the accompanying drawings.

Brief Description of the Drawings

Figure 1 is an elevated perspective view of a conventional window assembly for a mass-transit vehicle such as a bus or train;

Figure 2 is a partial sectional side view of a window assembly constructed in accordance with one embodiment of the present invention;

Figure 3 is an exploded view of the window assembly of Figure 2;

Figure 4 is a sectional side view of a window assembly constructed in accordance with an alternate embodiment of the present invention; and

Figure 5 is a sectional side view of a window assembly constructed in accordance with another alternate embodiment of the present invention.

Detailed Description of the Preferred Embodiment

Figure 1 depicts a conventional window assembly 10 typically used in mass transit vehicles such as buses and/or trains. With initial reference to Figures 1-3, disclosed is one embodiment of a window assembly 10 constructed in accordance with the present invention. The window assembly 10 typically comprises a rectangular or regularly shaped closed frame 12, preferably comprised of metal or rigid plastic, which is mounted to the vehicle (not shown) or, alternatively, could be formed integrally with the vehicle. The frame 12 desirably comprises an inwardly-facing L-shaped support leg 18, which desirably extends about the entire periphery of the frame 12. In the disclosed embodiment, the support leg 18 comprises a transverse base 22 and an inwardly extending support face 24, substantially normal to the base 22, for receiving and supporting a corresponding L-shaped gasket 20. Preferably, the base 22 includes an

elongated channel 26 for receiving a corresponding extension 28 from the gasket 20 to interlock the gasket 20 to the frame 12.

5 A piece of glazing 14 desirably sits within the gasket 20 which surrounds the periphery of the glazing 14 and desirably cushions the glazing 14 from vibrations and/or impacts experienced by the vehicle in a known manner. The transverse base 22 and support face 24 of the frame 12 and the gasket 20 desirably provide side support and an edge seal for an outside and marginal edge of the glazing 14 in the frame 12. In the disclosed embodiment, the glazing 14 is desirably equal to or smaller than the opening formed in the frame 12 by the L-shaped support legs 18.

10 A retainer 32 releasably secures the inner edge of the glazing 14 within the frame 12. As illustrated, the retainer 32 desirably comprises a vertically extending retention member 36 having a lower vertically extending leg 34 shaped to fit into an elongated pocket 30 formed in the frame 12. The retention member 36 further comprises a window gasket 42 a supplemental gasket 43 positioned on the upper surface of the window gasket 42 and a protective panel gasket 44, with these gaskets 42, 43, 44 desirably extending outward from the member 36 towards the glazing 14.

15 Preferably, the retainer 32 is formed of a resilient material such as aluminum, plastic or a composite material with the extending leg 34 including a serrated portion which mates with a serrated interior of the elongated pocket 30 to tightly yet releasably secure the retainer 32 to the frame 12. Of course, one skilled in the art would recognize that various other locking arrangements could be used to ensure positive retention of the retainer 32 within the pocket 30, such as interlocking ridges, hooks, or the like. In addition, the retention member 36 desirably includes elongated spaced side cavities 38 and 40, for releasably receiving the window gasket 42 and protective panel gasket 44, respectively.

20 When the retainer 32 is secured to the frame 12, with the lower leg 34 positioned within the elongated pocket 30, the lower surface of the glazing 14 is desirably sandwiched between the window gasket 42, the supplemental gasket 43 and the L-shaped gasket 20. These gaskets 42, 43 and 20 are desirably formed of an elastic material having good rebound characteristics, such as rubber, silicone or the like, which allow the window gasket 42 to be compressed against the glazing 14 when the retainer

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32 is installed and/or removed from the frame 12, but rebounds and pushes against the glazing 14 when released, desirably securing the glazing 14 in position and biasing the serrated portions of the lower leg 34 and the elongated pocket 30 together.

As shown in Figure 2, a sacrificial protective panel 16 is desirably positioned against the glazing 14 and inserted between the retainer 32 and the glazing 14. Desirably, the protective panel 16 slides between the protective panel gasket 44 and the glazing 14, with the lower edge of the protective panel 16 abutting against the supplemental gasket 43, such that the lower edge of the protective panel 16 prevents removal of the retainer 32 from the frame 12. Moreover, as previously noted, the presence of the protective panel 16 between the protective panel gasket 44 and the glazing 14 biases the serrated portions of the lower leg 34 and the elongated pocket 30 together. In this manner, the protective panel 16 is secured against the glazing 14 by the protective panel gasket 44, and the retainer 32 is secured within the frame 12.

In the embodiment disclosed, the protective panel gasket 44 is desirably T-shaped, a shape which desirably facilitates insertion and removal of the protective panel 16 from the frame 12. Of course, as well known in the art, a wide variety of alternate shapes and sizes of gaskets would accomplish the goals of the present invention, including triangular, rounded and/or angled gasket surfaces. Furthermore, the window gasket 42 desirably incorporates a flattened, partially flattened or curved surface facing towards the edge of the protective panel 16, an orientation which facilitates retention of the retainer 36 in the frame 12 by the protective panels 16. In addition, those skilled in the art will appreciate that a single gasket (not shown), incorporating the shapes of both the protective panel gasket 44 the window gasket 42 and the supplemental gasket 43, could be used in place of the gaskets 42, 43 and 44 with varying degrees of utility.

While not shown, the upper portion of the frame 12 may incorporate a similar retainer and frame arrangement as previously described, as may the right and left portions of the frame 12. Such arrangements would maximize the ease with which the glazing 14 and protective panel 16 could be removed and/or replaced in the window assembly 10. Alternatively, one or more of the edges of the window assembly 10 could be of conventional construction, incorporating permanent and/or semi-permanent retention walls. In such an arrangement, the glazing 14 would desirably slide between

the permanent and/or semi-permanent retention walls of the window assembly 10, with the securing arrangement of the present invention being utilized on one or more edges to secure the glazing 14 into the window assembly 10.

If desired, the protective panel 16 can be installed into the window assembly 10 by various well known methods. For example, if the protective panel 16 is formed of a sufficiently flexible material, it may be initially flexed such that the edges of the panel 16 can be positioned against the glazing 14 at its edges, between the retainer(s). As the protective panel 16 is released, and resumes its unflexed shape, the protective panel 16 desirably passes between the retainer 32 and the glazing 14, where it desirably secures the retainer(s) 32 in the previously described manner. Such a protective panel 16 may be quickly and easily removed from the window assembly 10 using a suction gripping device (not shown), such as commonly used to transport windowpanes and mirrors.

Alternatively, a protective panel 16 could be installed into the window assembly 10 by providing a void in the upper edge of the window assembly 10, such as best seen in Figure 4. In this alternate embodiment, the upper edge of the panel 16 may be inserted into the upper void 17, with the panel 16 being pushed between the glazing 14 and the protective panel gasket 44, into the void 17, until the lower edge of the protective panel 16 is raised sufficiently to pass over the retainer 32 and the protective panel 16 positioned adjacent the glazing 14. The protective panel 16 may then be pushed downward with the lower edge of the protective panel 16 passing between the protective panel gasket 44 and the glazing 14 in the previously-described manner, thus securing the retainer 32 into the frame 12.

As is illustrated in Figure 4, in this embodiment, the upper window assembly 10 is substantially similar to the lower window assembly 10 in that it includes the frame member 12, the retainer 32, the window gasket 42 and the protective panel gasket 44. However, the upper window assembly 10, in this embodiment does not include the supplemental seal 43 in the space 17. Hence, there is space to allow the protective panel 16 to be moved with the suction cups (not shown) in the previously described manner so as to remove the lower edge of the protective panel 16 out from the space between the panel gasket 44 and the glazing 14.

Figure 5 depicts a window assembly 10 constructed in accordance with an alternate embodiment of the present invention. Because the basic construction of this embodiment is essentially similar to the embodiments previously described, like reference numerals will be used for similar components.

5 In the embodiment of Figure 5, the window assembly 10 incorporates both inner and outer protective panels 16 and 19. The outer protective panel 19 is desirably sandwiched between the glazing 14 and the L-shaped gasket 20, with an elongated notch 21 formed in the L-shaped gasket 20 to accommodate the outer edges of the outer protective panel 19.

10 Desirably, the outer protective panel 19 can be removed from the window assembly 10 by removing the glazing 14 in the previously-described manner and then removing the outer protective panel 19. In this manner, the inner protective panel 16 secures the window assembly 10 when desired, but allows the simple and easy removal of the inner and outer protective panels 16 and 19 and the glazing 14 when desired for
15 maintenance.

One skilled in the art would appreciate that the disclosed window assembly, having outer and inner protective panels, could similarly be incorporated into a mass transit vehicle with the retainer members located on the outside of the window assembly, such that removal of the protective panels and retainer members could only
20 be accomplished by individuals located outside of the vehicle. Such an arrangement would make it even more difficult for occupants of the vehicle to access and/or remove the retainer members from the window assembly, further limiting possible vandalism of the window frame assemblies while the vehicle is in operation.

From the foregoing description, it should be appreciated that the assembly and
25 disassembly of the window assembly 10 and the attachment and removal of the protective panel 16 over the glazing 14 is easy and rapid. In particular, in assembly of the window assembly 10, the gasket 20 can be easily installed to the frame 12 via the channel 26 readying the frame 12 for reception of the glazing and any desired protective panels. With the glazing 14 and any outer protective panel in place, the retainer 32 is
30 inserted into the frame 12 with the lower leg 34 of the retainer 32 seating in the pocket 30. The combination of frame 12, retainer 32 and gaskets 20 and 42 effects a positive

weather seal. The inner protective panel 16 may then be inserted between the retainer 32 and the glazing 14, thereby securing the retainer 32 into the frame and inhibiting removal of the retainer 32 by non-maintenance personnel. In addition, the rigid surface of the retainer 32 facing towards the occupants of the vehicle desirably resists the effects of wear and/or vandalism, thereby significantly increasing the life of the window assembly 10. The removal of the glazing 14 is easily accomplished by removing the protective panel 16, removing the retainer 32 and then taking the glazing, i.e. glass, acrylic or other transparent and/or semi-transparent material, from the frame 12.

Although the foregoing description of the preferred embodiment of the present invention has shown, described and pointed out the fundamental novel features of the invention, it will be understood that various omissions, substitutions, and changes in the form of the detail of the apparatus as illustrated as well as the uses thereof, may be made by those skilled in the art, without departing from the spirit of the invention. Consequently, the scope of the present invention should not be limited to the foregoing discussions, but should be defined by the appended claims.